DETAILED ACTION

Response to Arguments

[1] Presented arguments have been fully considered but are held unpersuasive. Examiner's response to the presented arguments follows below.

Claim Rejections - 35 USC § 103

Summary of Arguments:

Regarding claims 1, 10, 19 and 22 applicant argues the following:

1. Parke does not teach the following:
    a. "a first spatial interpolator adapted to generate a low spatial frequency component from a low resolution image frame of said at least one image sequence" [appeal brief: page 18, para. 1].
    b. "a high spatial frequency component generator for generating a high spatial frequency component from at least one high resolution image frame of said at least one image sequence" [appeal brief: page 18, para. 1].
2. There is no motivation to combine the references to arrive at the claimed invention because the Parke's invention already involves aligned images and there is no need to include a remapper to Parke's invention [appeal brief: page 19, para. 3].

Examiner's Response:

Examiner disagrees.

Regarding claim 1, Examiner argues the following:

1. Parke does teach the following:

a. a [first spatial interpolator] adapted to generate a low spatial frequency *(i.e. 211)* component from a low resolution image frame *(i.e. 210)* of said at least one image sequence *[fig. 2; col. 4, ll. 47-61]*. It can be seen here that the low pass filtering is performed on the low resolution frame to generate the low frequency component.

b. a [high spatial frequency component generator] for generating a high spatial frequency *(i.e. 221)* component from at least one high resolution image frame *(i.e. 220)* of said at least one image sequence *[fig. 2, col. 5, ll. 1-10]*. It can be seen here that the high pass filtering is performed on the high resolution frame to generate the high frequency component.

2. Application of Parke's invention in field of non-aligned images would require some form of aligner. Non aligned images are common in the field of moving scenes (i.e. such as a basketball game). Furthermore, in view of KSR v. Teleflex (cited by the applicant) the combination would be obvious at least for the following reasons:

   a. Applying a Known Technique to a Known Device (Method, or Product) Ready for Improvement To Yield Predictable Results:

      i. Here the base device being Parke's invention.

      ii. Known technique being the remapping disclosed by Turner. It should also be noted that this technique is commonly applied in MPEG (a notoriously well known standard).

      iii. One with ordinary skill would have recognized that applying remapping technique to Parke's invention would yield in the predicable result of motion compensation and the improved system

of motion compensated high resolution image generator. Since, motion compensation is notoriously well known in the field as standard for moving image processing.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

[2] Claims 1, 3-5, 10, 12-14, 19 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parke[i] in view of Turner[ii] et al. ("Turner").

Note: The terms enclosed by "[]" are interpreted by the functionality that the claim defines for them (i.e. by phrases such as, "adapted to" and "for").

Regarding claim 1, Parke discloses the following claim limitations:

A system for reconstructing a high resolution image *(i.e. high resolution output)* from at least one image sequence of temporally related high *(i.e. 220)* and low *(i.e. 210)* resolution image frames, each of said high resolution image frames including a low spatial frequency component and a high spatial frequency component *(fig. 2; col. 5, ll. 5-10)*, said system comprising: a [first spatial interpolator] adapted to generate a low

spatial frequency *(i.e. 211)* component from a low resolution image frame *(i.e. 210)* of said at least one image sequence *[fig. 2; col. 4, ll. 47-61]*; a [high spatial frequency component generator] for generating a high spatial frequency *(i.e. 221)* component from at least one high resolution image frame *(i.e. 220)* of said at least one image sequence, said at least one high resolution image frame being closely related to said low resolution image frame *[fig. 2, col. 5, ll. 1-10]*; an [adder] *(i.e. 230)* for adding said ~~motion-compensated~~ high spatial frequency component estimate *(i.e. temporally interpolated high resolution frames, which have been high pass filtered)* of said low resolution image frame to said generated low spatial frequency component *(i.e. spatially interpolated low resolution images, which have been low pass filtered)* of said low resolution image frame to form a reconstructed high resolution image *(i.e. high resolution output)* of said low resolution image frame *[fig. 2; col. 6, ll. 40-55]*.

Parke does not explicitly disclose the following claim limitations (emphasis added):

a [remapper] for mapping said high spatial frequency component to a **motion-compensated** high spatial frequency component estimate of said low resolution image frame; and

However, in the same field of endeavor Turner discloses the deficient claim limitations, as follows:

A remapper for mapping a high resolution image to generate a motion-compensated *(i.e. move pixels based on motion vector)* high resolution image *[col. 4, ll. 60-67; col. 5, ll. 14-23]*.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify Parke's temporal interpolation to include motion compensation as taught by Turner's

temporal interpolation, the motivation being to generate images of a moving scene *[col. 1, ll. 56-60]*. Furthermore, in view of KSR v. Teleflex (cited by the applicant) the combination would be obvious at least for the following reasons: Applying a Known Technique to a Known Device (Method, or Product) Ready for Improvement To Yield Predictable Results:

i. Here the base device being Parke's invention.

ii. Known technique being the remapping disclosed by Turner. It should also be noted that this technique is commonly applied in MPEG (a notoriously well known standard).

iii. One with ordinary skill would have recognized that applying remapping technique to Parke's invention would yield in the predicable result of motion compensation and the improved system of motion compensated high resolution image generator. Since, motion compensation is notoriously well known in the field as standard for moving image processing.

Regarding claim 3, Parke and Turner meet the claim limitations, as follows:

The high resolution image reconstruction system of claim 1, wherein said first spatial interpolator upsamples the low resolution image frame in accordance with a bicubic upsampling algorithm *[Bicubic upsampling is notoriously well-known. Official Notice is taken. See Zavaljevski[20] et al. at col. 4, ll. 1-5 for evidence. The common knowledge or well-known in the art statement is taken to be admitted prior art because applicant failed to traverse the examiner's assertion.]*.

Regarding claim 4, Parke and Turner meet the claim limitations, as follows:

The high resolution image reconstruction system of claim 1, wherein said first spatial interpolator upsamples the low resolution image frame in accordance with a bilinear upsampling algorithm *[Bilinear upsampling is notoriously well-known. Official Notice is taken. See Zavaljevski[iii] et al. at col. 4, ll. 1-5 for evidence. The common knowledge or well-known in the art statement is taken to be admitted prior art because applicant failed to traverse the examiner's assertion.]*.

Regarding claim 5, Parke and Turner meet the claim limitations, as follows:

The high resolution image reconstruction system of claim 1, wherein said first spatial interpolator upsamples the low resolution image frame in accordance with a least squares error minimization algorithm *[Least squares error interpolation is notoriously well-known. Official Notice is taken. See Zavaljevski[iii] et al. at col. 4, ll. 1-5 for evidence. The common knowledge or well-known in the art statement is taken to be admitted prior art because applicant failed to traverse the examiner's assertion.]*.

Regarding claims 10, 12, 13, 14, 19 and 22 all claimed limitations are set forth and rejected as per discussion for claims 1, 3, 4 and 5.

[3] Claims 6 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parke in view of Turner further in view of Griessl[iv] et al. ("Griessl").

Regarding claim 6, Parke and Turner meet the claim limitations as set forth in claim 1.

Parke and Turner do not explicitly disclose the following claim limitations:

> The high resolution image reconstruction system of claim 1, wherein said high spatial frequency component generator includes a downsampler for downsampling at least one high resolution image frame of said at least one image sequence.

However, in the same field of endeavor Griessl discloses the deficient claim limitations, as follows:

> A downsampler (*i.e. MotionPyramid)* for downsampling at least one high resolution image frame *[col. 6, ll. 1-27]*.

It would have been obvious to one with ordinary skill in the art at the time of invention to modify the teachings of Parke and Turner with Griessl to downsample the high resolution image frame, the motivation being to perform hierarchical motion vector calculation *[col. 4, ll. 60-65]*.

Regarding claim 15 all claimed limitations are set forth and rejected as per discussion for claim 6.

Allowable Subject Matter

[4] Claims 2, 7-9, 11, 16-18, 20 and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Contact Information

[5] Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mr. Sath V. Perungavoor whose telephone number is (571) 272-7455. The examiner can normally be reached on Monday to Friday from 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Matthew C. Bella whose telephone number is (571) 272-7778, can be reached on Monday to Friday from 9:00am to 5:00pm. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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[i] US 5,025,394
[ii] US 6,198,505
[iii] US 6,101,235
[iv] US 6,370,196